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ICT Update

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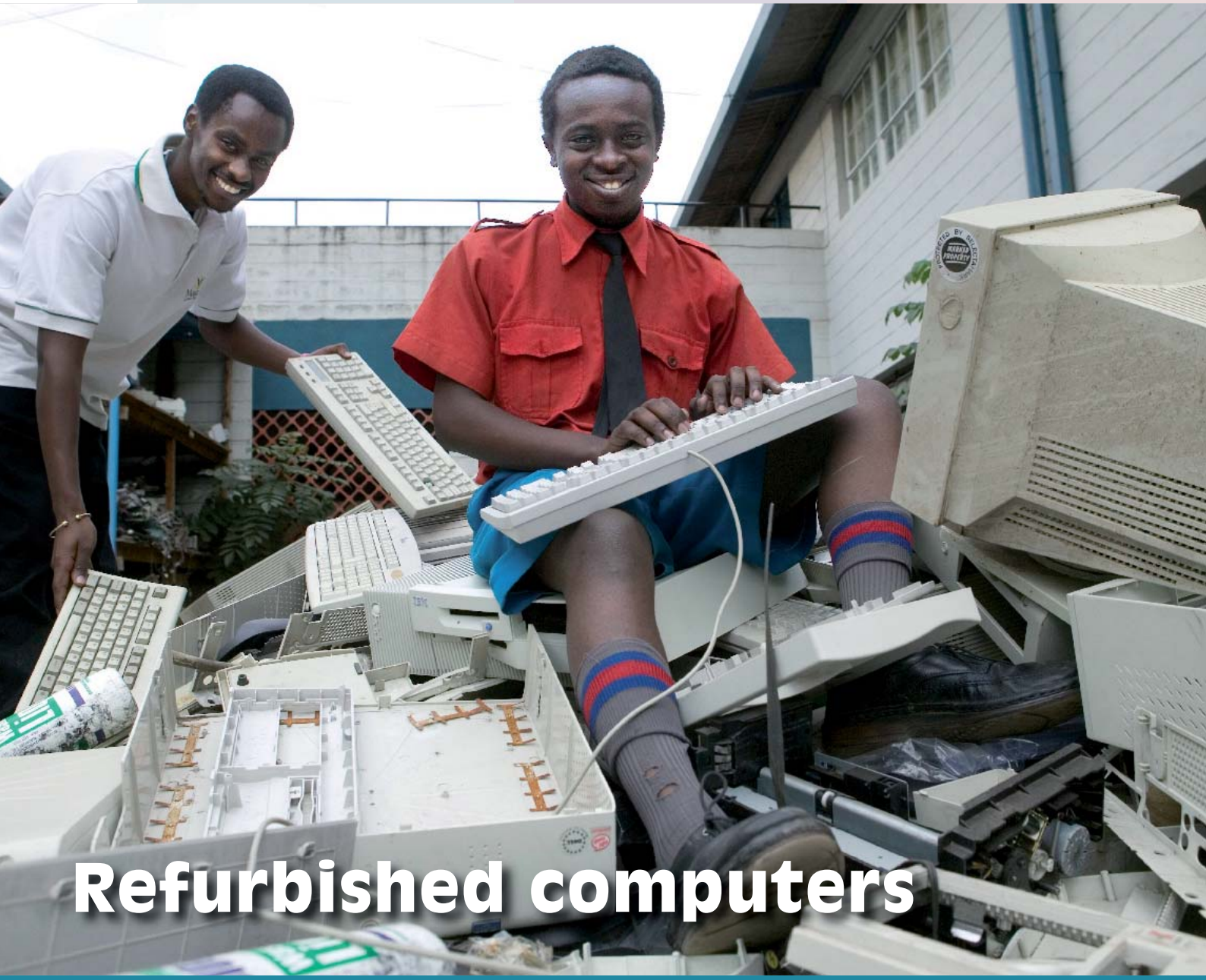
CTA
http://ictupdate.cta.int

Supplying and maintaining refurbished computers for schools in **Kenya**

Farmers in **Uganda** use old PCs to learn new skills and increase their incomes.

Dealing with the problems of e-waste in **Trinidad and Tobago**



Refurbished computers

Contents

ICT Update

ICT Update issue 38, August 2007. *ICT Update* is a bimonthly printed bulletin with an accompanying web magazine (http://ictupdate.cta.int) and email newsletter. Each issue of *ICT Update* focuses on a specific theme relevant to ICTs for agricultural and rural development in African, Caribbean and Pacific (ACP) countries, and includes feature articles and annotated links to related web resources and projects. The next issue will be available in October.

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http://ictupdate.cta.int

Editorial

An opportunity not to be wasted

Every few years, organizations, companies and individuals worldwide decide to replace their computer systems, but often don't know what to do with their old equipment. As a result millions of working computers are stored in basements or, worse, end up in landfill sites with potentially damaging consequences for the environment.

Meanwhile, governments and NGOs in many ACP countries are struggling to buy computers, which are still prohibitively expensive. There are also additional costs of providing training and support, particularly in rural areas. After all, even a new computer is useless if no one knows how to use it, or if it breaks down on day one. There are, however, a few organizations, working globally and locally in developing countries, that are trying to redress this imbalance by keeping the discarded machines out of the rubbish tip and putting them back to work for a few more years.

Refurbishing can extend the working life of old computers

Specialist charities and businesses, and increasingly computer manufacturers, are taking old computers and shipping them out to organizations in developing countries whose budgets do not stretch to the latest models. Some, such as Computer Aid, collect donated computers, refurbish them, and then ship them directly to their partners. Others, such as Computers for Schools Kenya or SchoolNet Namibia, buy old PCs and refurbish them, and then pass them on to schools and colleges where they can last another three or four years.

These old computers give valuable technology skills to schoolchildren, help train teachers and healthcare workers, allow rural communities to communicate with each other and can even increase the farmers' incomes. But these old machines cannot last forever. They eventually get to a point where they are too slow or worn out to upgrade. What happens to them then?

The unfortunate reality is that many old computers are dumped, not in the countries where they originated, but in developing countries that do not yet have the skills, technical facilities, or appropriate legislation to ensure the safe disposal of the many hazardous materials they contain. One solution might be to charge a fee for every computer sent to a developing country to pay for it to be shipped back at the end of its working life. This could work like the recent European legislation (the Waste Electrical and Electronic Equipment directive), which aims to make manufacturers more responsible for collecting, treating and recovering electronic waste, and to combat the problem of what to do with old computers. This could prevent some countries being used as dumps for 'e-waste', as has happened in China and India, and increasingly in Nigeria and Mexico.

But considering that refurbished computers still cost money to buy, and to run, perhaps it would be a better option if developing countries were to invest in new machines? There are now several schemes to provide low-cost computers to developing economies. The One Laptop per Child project has designed an inexpensive, durable laptop specifically for use in schools. The Simputer, developed in India, attempts to offer a portable alternative to the PC, while big-name technology producers, such as Lenovo and Intel, are also developing their own versions of affordable computers. Even smartphones – with internet, text, video and audio technology – could substitute for desktop computers, particularly in dry, dusty environments.

In many ACP countries it is likely that both new and refurbished PCs will be needed to meet the steadily rising demand. It remains to be seen exactly how long it will take the developing world to acquire a sufficient supply of reliable computers, but think how far Europe and the US have come in just ten years. It is now unheard of for schools not to have computers. Will Africa have achieved the same success ten years from now? ■

Gladys Muhunyo
(gladys@computeraid.org) is Africa programme manager for **Computer Aid International** (www.computeraid.org)

Refurbished computers – new life for old machines

My first experience of a refurbished computer was as an undergraduate student during a one-year study break. That old laptop completely influenced my life on campus, and later led me to change my career from biology teacher to ICT development officer, now with 13 years' experience. Many other students like me would never have been able to afford a new PC. But simply placing a refurbished computer into their hands can offer them an otherwise unimaginable opportunity. It really can be a life-changing experience.

This is especially true for women and girls in many African societies who are often excluded from higher education and postgraduate studies. The recent introduction of global e-learning programmes is one way to improve their access to technology, and can also be extended to those living in rural communities. In Kenya, for example, Kenyatta University placed more than 1500 refurbished PCs in eight rural training centres as part of their open learning programme. This has provided women heads of household, adult learners and out-of-school youth the opportunity to participate in online vocational training which in turn will eventually lead to greater gender equality and social inclusion.

Refurbished computers can also have an impact at a distance, even in agriculture. In Africa, farming is the backbone of many societies. But the majority of farms are small in scale and located in rural and semi-arid areas. For these communities, timely and reliable weather information can help them decide on the best type of crop to grow, planting and harvesting times, and can even help in crop and animal disease management, all of which can make a great difference in terms of daily survival. By equipping rural weather stations across Africa with affordable ICT equipment, and improving local skills to collect, analyze and disseminate information, crop yields and livestock productivity can be increased. Such improvements can help to reduce, if not eradicate, poverty and hunger.

TONY LAW/REDUX/HH

Standards

These problems are not solved just by placing PCs on the ground. They must be supported by sound partnerships with the recipient institutions and other agencies. Today, my role is to oversee the expanding work of Computer Aid in Africa. Together with our own programme officers and our partners throughout the continent, we supply computers for education, health, meteorology and agriculture. This technology can provide real solutions to improve people's lives and achieve sustainable development.

The most important issue for us is always quality. All computers are fully tested at Computer Aid's warehouse in London, and only those that are found to be completely usable are distributed to African institutions. This is not always the case with the many individual initiatives that just collect and ship PCs to Africa, however noble their intentions. Sustainability, therefore, is also extremely important. Our computers are only placed with partners who have the skills to use them, and where technical support is available locally.

The final consideration is affordability. Schools and development projects often have to choose between purchasing a few new computers or many professionally refurbished PCs. Their ultimate decision is dictated by their budget and the numbers required. There are certainly many schemes for introducing computers to Africa, including the $100 laptop project. Will these laptops meet the criteria of quality, sustainability and affordability? Perhaps they will, but whatever option is chosen, the most important consideration is that the recipients must be able to make immediate and prolonged use of the equipment. Governments should therefore be encouraged to put into place policies and laws to ensure that end users benefit at all costs, without hindering development. Zero rating taxes on ICT equipment and services is one such step.

Beginning

Where would I be without computers? I can't even begin to imagine. What if I had started my career five years earlier? To have access now is better than 10 years from now when it comes to education. Today is better than two seasons too late when talking about food security. And one day can even make a difference when health information is needed as a matter of life and death.

It is said that to eat an elephant you have to cut it into tiny pieces and chew one piece at a time. And so it is with the problem of giving access to computers – there are still millions of children throughout the world without access and there is a long way to go. But I am glad to be playing my part in 'chewing up' the great ICT divide in Africa. Every one of the 90,000 PCs placed by Computer Aid so far is a bite towards closing that gap, and getting closer to our target of 10 PCs per 1000 people (currently 9.2 per 1000 in Africa). We have only just started! And it doesn't have to be only about computers. I own a TV converted from a refurbished PC monitor. Every effort is worth it as we strive towards bridging the digital divide. ■

Feature

The complete package

Giving young people access to technology has to involve more than giving away old computers. For one Kenyan organization it is also about training, partnerships and policy change, says Fred Okono.

Founded in 2003 by Tom Musili, the current executive director, Computers for Schools Kenya (CFSK) has grown steadily in terms of both operational activities and number of personnel. Modelled on the highly successful, award-winning Computers for Schools Canada, this charitable non-governmental organization began by placing 200 computers in just 10 pilot schools. CFSK now boasts eight regional centres and 400 beneficiary institutions around Kenya. Interestingly, this growth has been achieved solely by word of mouth and not through any marketing strategy – a deliberate policy considering CFSK's limited capacity. But the organization's growth does show the enormous hunger for information and communication technologies in Kenya.

All CFSK operations are built around a single core activity – the sourcing of quality, affordable refurbished PCs. Most of the 10,000 computers already placed in partner institutions so far have come from overseas, mainly from Great Britain. Donations have also been received from Canada, the Netherlands, Norway and the United States. Concerted efforts to generate local donations are also beginning to bear fruit.

Priorities

CFSK refurbishes all the computers it receives at three specialized centres which, together, can deal with more than 1000 computers each month. The computers are cleaned, repaired and, where necessary, reconstructed to conform to established CFSK standards. Most important, all residual data from previous owners is deleted, thus preserving the confidentiality of the donor. Once loaded with appropriate software, all the PCs are then thoroughly tested to make sure they are working properly.

But CFSK's involvement does not simply stop with supply. The technical services department runs a very busy preventive and curative maintenance schedule. Every institution receives two preventive maintenance visits annually and any number of curative maintenance visits as required. Plus, CFSK offers telephone and internet technical help lines to help users with any small or immediate problems.

Technical support is run from the regional centres, ensuring rapid turn-around times and optimized costs of operation. One major challenge is the availability of compatible spare parts, although some of the PCs received are dismantled to provide parts, and some suppliers generously include spare parts in their shipments.

Over and above adopting technology, CFSK must also adapt and modify it, and constantly look out for alternatives that are more suitable to the local situation. Researching and pioneering new and alternative technologies is also one of CFSK's core activities. In collaboration with various partners, CFSK has carried out pilot projects involving thin client systems, open source software, solar power technologies and wireless internet access.

The technical services department also plays a crucial role in capacity building. It takes on a large number of student interns and volunteers, and offers invaluable training with extensive hands-on experience that very few establishments can provide. Over the years, more than 200 young people have taken advantage of this opportunity to learn new skills, and have gone on to find gainful employment.

The organization has also developed a training-of-trainers course with eight customized training programmes. These are aimed at institutional managers, ICT and non-ICT teachers who are keen to apply ICTs to their teaching practice. To date, more than 2200 such professionals, including educational administrators from the Government of Kenya, have taken part in these training courses. CFSK's work in this area is particularly significant given that there is only one teacher training establishment in the country (also a partner institution) that is training ICT teachers. However, only CFSK offers specific training in the application of ICT to teaching methods and the development of ICT-based teaching materials.

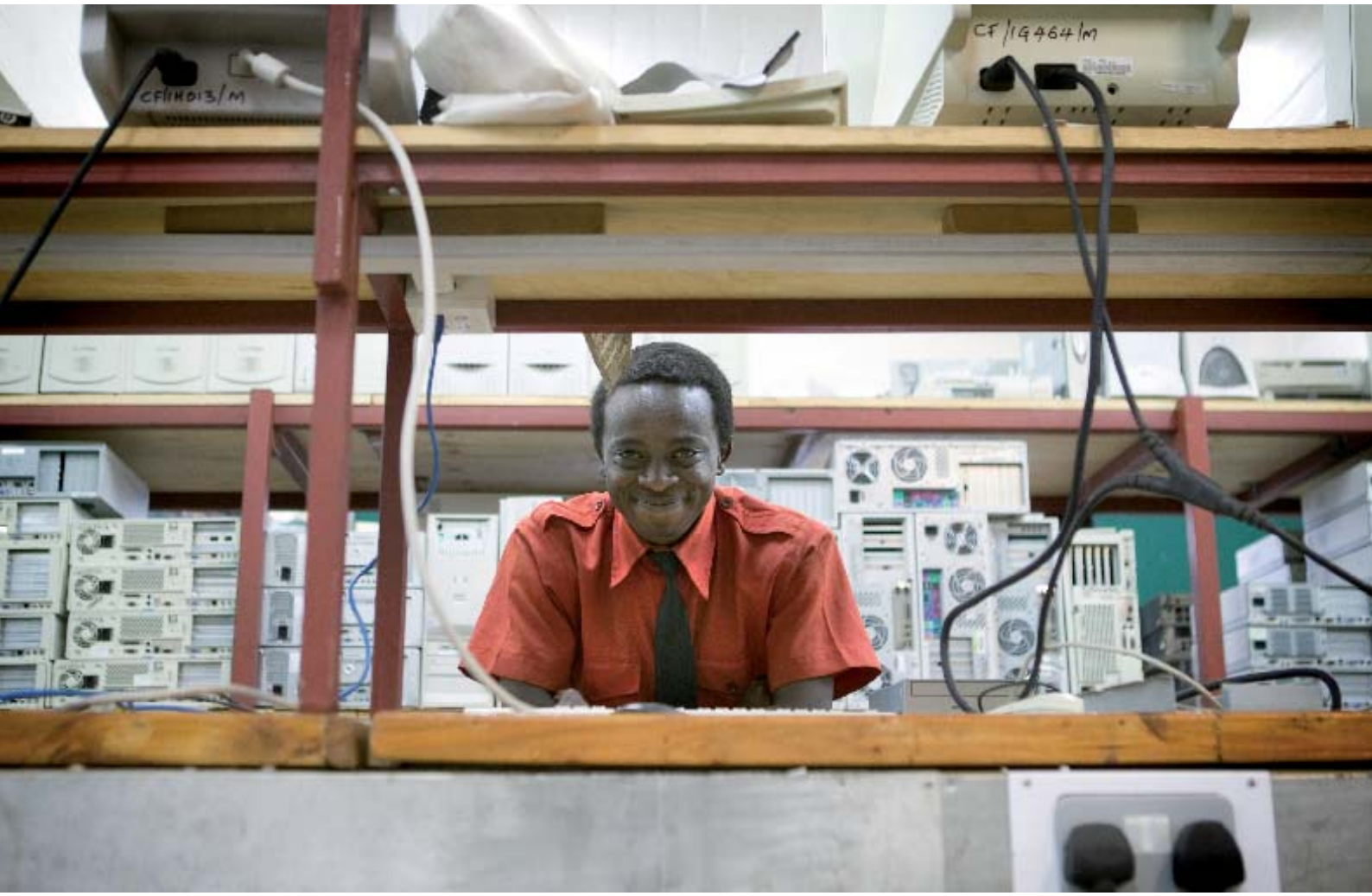
CFSK has spearheaded the development of a modular curriculum that can be easily adopted by educational and training institutions, and even community access and resource centres. The method is very flexible, catering for the unique requirements of each participating institution, and is supported by a significant amount of resource materials, including schemes of work, lesson plans and learning manuals. The organization has also recently started developing digital multimedia materials for teaching second-year science subjects in Kenya's secondary schools.

Salvaging

Cynics often view the shipping of refurbished computers to developing nations as a sophisticated way to transfer a waste disposal problem. Developing country institutions, however, lack the resources to buy brand new equipment. Large numbers of refurbished computers are therefore an affordable alternative. But these machines 'die' sooner than brand new ones and poorer nations still don't have the capacity to ensure the safe disposal of this 'e-waste'. In response, CFSK has developed a model for the management of e-waste.

As many parts as possible of the decommissioned computers are disposed of locally, providing it can be done safely. These parts include the chassis, casing and other parts that scrap metal and recycled plastic dealers are willing to purchase for a small price. Potentially hazardous parts (such as circuit boards and monitors) are

CHARLES STURGE/ALAMY



shipped out of the country by international partners for recycling either in Southeast Asia or Europe. More recently, CFSK has started converting monitors into affordable quality television sets – a very creative way of recycling and reusing this potentially hazardous equipment.

Influence

CFSK is operating in an important, rapidly growing and constantly changing field in which there is no defined state policy or regulatory authority directly responsible for the safe disposal of electronic waste. An enormous amount of work needs to be done to sensitize relevant policy makers and galvanize them into action. Standards must be defined, baselines drawn and benchmarks set to guide the process. Policy and advocacy work has therefore become an essential activity at CFSK, which includes establishing working partnerships with like-minded individuals and organizations working in the sector.

CFSK participates in relevant activities organized by the government and cooperates with various agencies. The organization runs sensitization seminars for policy and decision makers, and defines standards in the various areas of CFSK's activities, in the hope that these will form the basis for official national standards to guide ICT training. The organization continues to lobby for more government resources to incorporate ICTs in education, for an ICT policy defining national goals, and for the establishment of regulatory systems and monitoring mechanisms.

The policy and advocacy work of CFSK has already had observable effects in awareness creation. Education administrators and practitioners, at both school and government level, are increasingly appreciating the value of ICTs in both teaching and management. This is best exemplified by the growing number of requests for ICT training that CFSK receives from members of school boards as well as grassroots education officials. Many education officials have also requested computers to improve productivity in their own operations.

A successful model

CFSK's greatest achievement so far has been the establishment of a successful model for the sustainable delivery of ICT resources to poor communities. Although the organization is yet to achieve full sustainability, it is firmly on the path to doing so, and the same can be said for the individual partner institutions.

The organization has delivered computers to over 400 institutions, including primary and secondary schools, teacher training colleges, medical training centres, technical training institutes, children's homes, two universities and various community access and resource centres. The institutions that have benefited are found in all of the country's eight provinces, and serve well over 300,000 young people. By the end of 2007, CFSK hopes to have sourced and placed more than 15,000 PCs in 600 institutions. This will still be less than 15% of the estimated 4000 secondary schools in Kenya, but it is a beginning.

Technical support and maintenance form one of the pillars of the CFSK programme, distinguishing it from other initiatives, most of which fail due to lack of post-deployment support. CFSK's technical services team, many of them volunteers and student interns, keep the computer labs in partner institutions working remarkably well. Breakdowns are quickly resolved to minimize downtime, while other problems are pre-empted through

GREENSHOOTS COMMUNICATIONS/ALAMY

Related resources

Computers for Schools, Canada
➜ Computers for Schools, Canada, co-founded in 1993 by Industry Canada and the TelecomPioneers, refurbishes computers and related equipment donated by governments and businesses. These computers are distributed across Canada to schools, libraries and registered not-for-profit learning organizations.
http://cfs-ope.ic.gc.ca

Using Older and Refurbished Computers Developed by the Association for Progressive Communications (APC) and Bridges.org
➜ This workshop kit offers material which trainers can use as the basis of a workshop. It covers the basics of older and refurbished computers: what they are, benefits and risks of using them, who should use them, and where to get them.
www.itrainonline.org/itrainonline/mmtk/refu

Charities say no.
Wired News, 01 August 2002
➜ Tucked into corners and collecting dust in the closets of nonprofits worldwide, you'll find them: stacks of ancient computers, cracked monitors, tangled cords and drives without floppies. The hardware comes from well-meaning donors who hope their cast-offs can do others some good. But while second-hand technology is indeed a blessing for some struggling agencies, for most it's quickly becoming a costly curse.
www.wired.com/news/print/0,1294,49537,00.html

preventive maintenance. With the development of more regional technical service centres, CFSK hopes to bring technical support even closer to its partner schools. This would lead to a growth in its capacity-building function through the deployment of even more volunteers and student interns.

Obstacles

CFSK's achievements have been significant. However, it still faces formidable challenges. The limited supply of computers, for instance, remains a problem. There are usually more institutions ready to join the CFSK programme than there are computers available. This in turn hampers CFSK's activities in all other areas because the placement of computers is the platform from which all else springs.

Given that CFSK is a charity working with marginalized communities, the organization has learned how to make limited resources go a long way. But the lack of funds is a perpetual worry that often threatens ongoing operations and hampers expansion into critical areas.

There are also some consequences of CFSK's rapid expansion. Providing technical support and maintenance has become a significant problem given the large number of partner institutions distributed throughout the country. The demand for training is also just within CFSK's capacity. Continuing to provide quality service delivery therefore is becoming increasingly difficult, but we are responding by decentralizing more operations to the regions more rapidly – itself also a challenge given our current resource limitations.

One of the fundamental ideals of CFSK is that all young Kenyans are entitled to acquire ICT skills. Increasingly, especially in education, this means the World Wide Web. But Internet access in Kenya is very expensive, and is well beyond the reach of the under-resourced public education and training institutions, as well as the community access and resource centres that are CFSK's primary targets.

Some institutions and communities cannot raise even the modest amount CFSK asks for participation in the programme. In some cases, they have appealed to donors for the construction of a computer lab. As CFSK expands, this issue is bound to arise again and again. It is something the organization will have to address soon as it strives to close the divide between the haves and the have-nots, and between the urban and rural areas.

Long-term sustainability, however, is the most critical issue for CFSK. Over time, internally generated funds have increased as a proportion of the budget, whereas the early days we were largely donor funded. To secure the future, CFSK must generate more resources internally, both to finance existing operations and to allow for expansion and diversification. With this in mind we are exploring various revenue generation alternatives.

Determination

The Computers for Schools Kenya programme is doing valuable work, and is attempting it on a scale that would normally be the preserve of government. But the task is urgent and the government appears unable to tackle it at this time so that an intervention such as the work of CFSK is necessary.

In just five years, we have reached well over 300,000 young people who, without our involvement, would have had no access to ICTs. Schools on our programme have reported enhanced enrolment and greater interest in subjects that employ computers in the teaching and learning process.

However, only about 800 of Kenya's 4000 secondary schools and fewer than 300 of 19,000 primary schools have computers. An even smaller proportion of out-of-school communities have such access. Although a daunting task, with planning and determination it should be possible to reach all of these institutions and communities. ■

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Raising school standards

SchoolNet Namibia has developed a computer lab that can be installed in any school in the country, simplifying training and technical support.

Namibia arguably has made the best progress in adopting ICTs for education in Africa today, with more learners and teachers (per capita) using the internet than anywhere else on the continent. But that still means that fewer than 200,000 learners and 8000 teachers in Namibia have access to a computer. To achieve an adequate learner/teacher to computer ratio, Namibian schools will need at least 36,000 computers every three years.

SchoolNet Namibia (SNN) is a nonprofit organization operating a computer refurbishing centre in the outskirts of the capital city, Windhoek. The staff prefer to call it a technical service centre, as it also provides training and gives advice on ICT systems to the education and other development sectors. But the most crucial element of the operation is the technical support it provides to customers, which continues for three years after installation. It is still essential for providers of refurbished PCs in Africa to offer this kind of service as sufficient support for local users has yet to be developed, especially in the rural areas. It would be unacceptable for SNN to distribute refurbished computers to customers and then have no further dealings with them, as the computers are effectively useless after the first problem or breakdown.

Shop around

Since it opened in 2003, SchoolNet's technical service centre has refurbished thousands of computers and distributed them to schools and other educational clients throughout Namibia. More than 1000 computers were refurbished and delivered in 2004 alone.

For SNN the best way of sourcing PCs for refurbishment is to surf the internet and find traders in second-hand computers. From these dealers we can buy PCs for about US$45 per unit, which is much cheaper than the price of $90 per unit charged by some international donor agencies. Also, these agencies often supply 'trick or treat' bundles of PCs. This means that a consignment may be made up of variety of brands and models of computer, which has proved unworkable for SNN when trying to set up resource centres.

SNN imports only the computer casings containing the central processing units (CPUs). These are then converted to be used as 'thin client' workstations that will be connected to a new server computer. Mice, keyboards and monitors are purchased locally, as are the server computers, which are always new. The server computer also has an external modem so that the casing does not have to be opened if there is a problem with the modem. Most of the refurbishment work is carried out with the help of hundreds of voluntary unemployed youth, and many more are constantly being trained.

Standardized

SNN specializes in supplying schools with complete computer laboratories. A typical computer lab includes a new Pentium IV server computer, between 5 and 20 refurbished thin client diskless workstations and an uninterruptible power supply (UPS) unit. The server is loaded with an open-source (Linux) operating system that can access the internet via a modem (dial-up connection) or radio subscriber unit (for wireless connectivity). Other features include an 8-port Ethernet switch, Ethernet cabling, power cabling, extension cords, one five-plug adaptor, a conduit and all relevant software.

The PCs are installed on SchoolNet's innovative tabletops, called 'rose tables'. These circular tables are made locally and allow for two to three students to sit at each computer. It is also a safe design because all the cabling goes through the centre of the table, with no need for leads and cables to be spread all over the room. Another benefit of the rose tables is that all PCs can simply be unplugged during the school holidays and whenever the lab is not being used. The equipment can then be stored safely without having to deal with all the cables and leads.

SNN has also established three satellite workshops and training centres around the country to make local training and technical support services more cost-effective and efficient. Since the majority of schools served by SchoolNet are located in rural areas, these centres mean that teachers and learners do not have to travel hundreds of kilometres to the capital to solve their computer problems, thus saving them considerable time and expense.

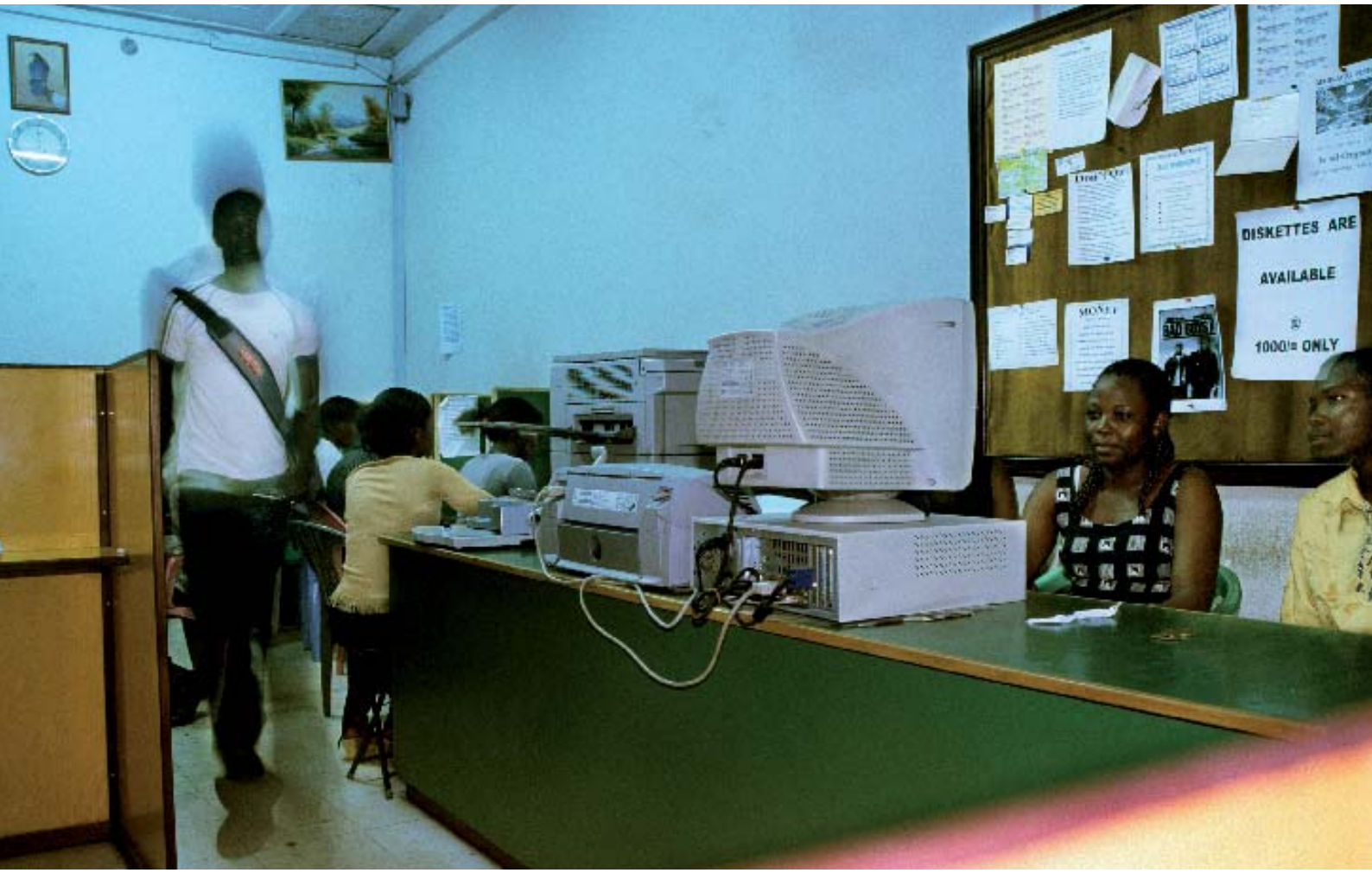
While SchoolNet Namibia can be very proud of its ICT development efforts to date there is still a need to encourage educators, learners and communities to embrace these ICTs in their lives through education, work and play. Ideally, within the next five years, the level of ownership of home computers in developing countries could be the same as in Northern countries. But that will only be possible if the cost of the technology drops significantly, to a level similar to that of basic mobile phones (US$100), for example. At present there are about 350,000 tech-savvy mobile phone users in Namibia. It would be great if they all had home computers too. ■

More information

ICT for Development in Africa, Volume 3 Networking Institutions of Learning –
➜ www.idrc.ca/openebooks/008-x/
SchoolNet Africa Course for Technical Service Centre Managers
➜ www.schoolnetafrica.net/fileadmin/1MillionPCsTraining/Index.htm
African SchoolNet Toolkit
➜ www.schoolnetafrica.net/1500.0.html
Joris Komen's blog
➜ tatejoris.blogspot.com

Joris Komen (joris@schoolnet.na) is the director of SchoolNet Namibia (www.schoolnet.na)

TONY KARUMBA/AFP PHOTO/ANP



New crops from old computers

Farmers in Uganda can now learn new skills and increase their incomes. A project using old computers has given rural communities Internet access and the opportunity to take part in e-learning programmes.

When I first heard that our organization, the Busoga Rural Open Source and Development Initiative (BROSDI) was considering using refurbished computers I was quite negative about the idea. As far as I was concerned, refurbished meant 'old' and 'used'. I thought we would be taking on someone else's junk and rejects. It was only after some research that I learned that many of the hardware components of a refurbished computer have either been replaced or even updated with newer technology than the original.

BROSDI was looking for a way to encourage a culture of gathering existing knowledge and to find ways of sharing that information, especially in the areas of education, agriculture and health, in order to stimulate socio-economic development in rural Uganda. We wanted computers for our staff and residents of rural areas to document information which could then be disseminated through our various channels.

We knew what we wanted to do, and how to do it. We even had a venue for the community centre, but we had no computers and only limited funds. Through a number of partners, we got to know about Computers for Development, a Dutch foundation that provides refurbished computers, as well as training and support, to schools, hospitals and projects in Africa. When we contacted them they told us they could supply personal computers and other hardware, including monitors, laptops, printers, modems, etc., which would be cleaned, tested and configured according to our requirements. BROSDI would not have to pay for the equipment, but would have to cover the freight costs. We agreed, and in 2005 one hundred computers were delivered to our office in Wainha Village in the district of Mayuge a few hours' drive from the capital Kampala. The challenge now was to decide how to use and distribute the computers.

Success

At our development centre we had reserved two rooms, one for an internet and training unit and the other for the 'Academic Bank', where we provide resources for the education programme. For many of our partners it was the first time they had ever seen a computer. Today, the computers are used by researchers from Busoga University. They are also used by BROSDI programme staff, by staff from Buluba Hospital, and by primary and secondary schoolteachers involved in our education programme. The

computers are also available to people in the surrounding rural communities. Members of our agricultural programme, Collecting and Exchange of Local Agricultural Content (CELAC), also use the computers to record the minutes of meetings and document their activities, and to upload the information onto the relevant websites and blogs.

One interesting story that came out of this work concerns Mulopi Joseph, a farmer attached to the CELAC programme. He used to grow only a single crop of cabbages per year which he sold, irrespective of the weight, for USh100 (€0.04) per cabbage. While surfing the Internet one day, he found the telephone number of a vegetable buyer in Kampala. He contacted the buyer, who expressed interest in his cabbages and agreed to buy them for USh300 per kilo. The buyer also made arrangements to collect the cabbages straight from Mulopi's garden, so he did not even have to pay transport costs. Mulopi, being the enterprising man he is, went back to the Internet to look for information on how to grow cabbages all year round. Today, Mulopi is no longer producing just one crop of cabbages each year, but several crops year-round that contribute greatly to his household income.

ROEL BURGLER/HH

Progress

Initially, BROSDI provided free Internet access but within seven months the number of users increased so much that we were forced to regulate the time they could spend at the computer. Now, only the first thirty minutes are free, but we charge a fee for time spent online after that. Most users are from our partner organizations who use the computers to read local newspapers online and to access international news websites, to check their email and to search for information.

The teachers using our computers as part of the education programme work mostly with orphaned children at primary school level. The children are encouraged to write entries for a blog, the 'Hope Children's Club', to help them learn to express themselves and to promote dialogue. Using this simple blog has helped to build the children's confidence both at home and at school, this has even led to improved performance in the classroom.

In the near future, we will install a social and educational e-learning management system developed by our IT department and staff at the Standard College of Buwagi. The college, one of our education programme partners to whom we donated 18 refurbished computers, has set up a laboratory where teachers, parents and students can learn how to use a computer. The e-learning programme will run on an open source platform supported by Moodle (an education course management system) and will be used by primary schoolchildren and their teachers. After further development of the system, the children will have the necessary basic skills to use the programme, which can then also be easily adapted to meet their specific needs. Eventually, we intend to develop a series of CD-ROMs for distribution to other schools further away from our computer centre.

We have certainly had some encouraging results from the users of the refurbished computers. They can be a good, affordable solution for organizations like BROSDI involved in documentation and information dissemination using ICTs and working with diverse partners spread over a large area. If asked the question: 'Would you use refurbished computers again?' I would say 'yes', especially now I know what to look out for (see box). ■

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More information

BROSDI Education Programme:
www.brosdi.or.ug/reports.html
Collecting and Exchange of Local Agricultural Content (CELAC) blog:
www.celac.wordpress.com
Computers for Development:
www.computersfordevelopment.org
Hope Children's Club blog:
http://360.yahoo.com/hope_childrens_club

Advice when buying refurbished computers based on BROSDI's experience

- Bear in mind that in any batch of refurbished computers it is possible to get a defective machine.
- Be careful about the brand of computer. Only buy those from reputable companies to be sure that the parts are high quality. It might even be possible to obtain a warranty.
- Insist that the supplier sends the proper software documentation and licences. This will prevent you from receiving stolen computers that are being presented as refurbished. Better still, request copies of this documentation upfront. You might also need it when reinstalling the software, applying a system restore or back-up.
- If you live near the supplier, pay them a visit and try out the refurbished computers. If possible, get an IT expert to check the CDs and disk drives, and to give advice on the graphics, video and sound drivers. Also check the condition of accessories like the mouse, monitor, keyboard, etc.
- Always ask the supplier what kind of support is available, and for how long. Maintenance from another company can be expensive.

For more details on what to look for in a refurbished computer, see the TechTip on page 11.

JAMES DAVEY/CONCERN WORLDWIDE

Clean up campaign

Trinidad and Tobago's waste management programme provides a model for smaller countries starting to deal with discarded electronics.

Computers, cell phones, mp3 players and digital cameras have all become familiar items in the last 10 years. They are also increasingly present in rubbish dumps, with old PCs causing particular concern as they contain many toxic substances. The dumping of old electronic equipment is now turning some areas of China, India and Nigeria into environmental disaster zones. For smaller countries, especially those with still developing economies, the problem may not yet be so great. In Trinidad and Tobago, for example, the state Solid Waste Management Company Limited (SWMCOL) decided it was better to act now because, as their environmental manager, Alban Scott, points out, 'there will only be more computers in the years to come, not less.'

'The system here just isn't ready to absorb e-waste,' adds Scott. 'Computers come with all kinds of hazardous material - bromine dust, lead, cadmium, mercury and arsenic. We are trying to avoid these things getting into the normal stream of waste disposal.'

SWMCOL has been running its e-waste programme for three years, a large part of which involves informing local residents about the problems of e-waste. The project began with a single radio programme in 2005, explaining electronic waste and its potential environmental hazards. This was followed up by organizing a collection system where residents and businesses could call and ask SWMCOL to pick up their old PCs. Businesses are the largest users of computers so it was especially important to target them with the safe disposal message. 'We have a lot of big businesses here,' Scott explains, 'and they don't want to get the name of throwing away waste like that. They were also made aware of the problems they could have by leaving sensitive data on computers they dispose of. Once they knew the facts they responded very well to the campaign.'

Public awareness

The project has now expanded to four hour-long radio programmes each week, accompanied by regular interviews on television and in local newspapers. SWMCOL staff also visit schools to explain the problems of e-waste and safe waste disposal in general. Plus, there is what has now become an annual symposium on e-waste. Experts are invited to present papers on subjects such as the re-use and recycling of e-waste, the legal implications of exporting old electronic equipment and practical methods of sorting and safely disposing of hazardous materials.

For SWMCOL, an important aspect of these conferences is that they open for anyone to attend. Local residents in particular are encouraged to get involved, says Scott. 'They can come and hear experts from all over the world talking about e-waste and explaining the issues. At one conference we had a specialist from Europe who showed pictures of the problems in Africa and Southeast Asia, and the horror of what these computers and their dismantling can cause. That generated a lot of interest and concern.' The symposia also attract media attention, giving the campaign yet more coverage in local newspapers, TV and radio.

At the moment, after collection, SWMCOL stores the old computers, TVs, and even batteries until there is enough to make it cost effective to transport out of the country, usually to recycling plants in the United States. As a signatory to the Basel Convention (see box), Trinidad and Tobago does not allow imports of e-waste into the country. Even refurbished computers for schools cannot be imported. Until recently, schools received donated computers from local businesses, but now the Ministry of Education runs its own scheme to provide them.

Having access to technology is a big advantage for the young people of Trinidad and Tobago, but having more computers now inevitably means more e-waste in the future. The only solution, says Alban Scott, is to lobby electronics manufacturers to produce goods that are more environmentally friendly. 'They say they are looking at the issue,' he explains, 'but we, as a small organization, cannot influence these large corporations, we can only lobby them and provide information to get their support. In the meantime, we can encourage people to buy only the brands which are the least hazardous. When producers see that's what the buyer wants then maybe we will eventually see a computer that is truly environmentally friendly.' ■

ICTUpdate spoke to **Alban Scott** (ascott@swmcol.co.tt), environmental manager at **Solid Waste Management Company Limited** (www.swmcol.co.tt)

The Basel Convention

Trinidad and Tobago has made a deliberate effort to keep e-waste out of the country by banning imports of old electronic equipment, including computers and even mobile phones. The movements of hazardous waste between countries are regulated by the Basel Convention, an international treaty signed by 170 nations. The demands for such a treaty grew in the late 1980s after two incidents involving ships carrying toxic waste, the *Karin B* and the *Pelicano*.

Countries such as China and India are also parties to the Basel Convention, but they remain popular destinations for toxic waste. Exporters are able to exploit loopholes in the convention – for instance, the cargo may be covered by the treaty but the ships carrying it are not. There is also a lot of money to be made from e-waste, making it worthwhile for unscrupulous traders to pay off corrupt officials. Combined with the lack of political will in many countries, efforts to enforce the convention are continually undermined.

For more information, visit www.basel.int

A. FARNSWORTH/AGE FOOTSTOCK/ANP

What to look for in a refurbished computer

Most refurbished computers in developing countries are supplied by charitable organizations or companies that specialize in upgrading, refurbishing and distributing used equipment. These professional suppliers remove the old software and data, and then test the PCs to ensure they function well. Examples include:

- Computer Aid: www.computeraid.org
- Computers for Schools Kenya: www.cfsk.org
- Digital Links: www.digital-links.org

There may also be local commercial suppliers of old computers. Some might even provide a guarantee, but usually this will cover only a very short period (rarely more than six months). The computers they supply are generally regarded as 'second-hand' rather than 'refurbished', meaning that they may not have been cleaned, or old components may not have been replaced. They may even contain programs installed by the previous owner, as well as potentially damaging viruses.

Minimum specifications

Most professional refurbishing organizations will only accept used computers that meet minimum standards or specifications. These standards are intended to ensure that the computers can be used for a reasonable time, usually three or four years.

For organizations considering buying second-hand or refurbished computers, it is important to check these minimum specifications and assess whether the machines on offer will suit their needs.

For example, small organizations (employing up to five people) will need computers for word processing, simple spreadsheets and occasional text-only emails. They rarely use the internet, or share files with external partners (documents produced using software found on older computers, or open source software, may not be compatible with the software used by partners). Such organizations should look for computers with at least a Pentium II 300 MHz processor and a 4 gigabyte (GB) hard drive.

Larger organizations, or ones that are likely to expand and need more software, are likely to use the internet and email regularly, and to want to share files with others. They should therefore look for computers with at least a Pentium III 450 MHz processor and a 6 GB hard drive.

Some organizations have more specialized requirements. The media departments of NGOs, for example, may wish to use powerful software packages to produce high-quality graphics, desktop publishing and presentations. They may also need to be able to send large files to partners and customers over the Internet. They will therefore need computers with features available only on the newest models, which might be difficult for refurbishing organizations to supply. But costs can still be kept down, especially if only a few users need these high-spec machines.

Keeping costs low

One way for an organization to minimize costs is to install a 'thin client' system or network. This is where several 'client' computers or workstations are connected to one central computer, the 'server', which does all the processing and memory work to supply the clients. Thin client systems have several advantages:

- the client computers operate on very low specifications; only the server computer needs a fast processor and substantial memory capacity;
- only the server computer needs to be upgraded; and
- the client computers have no moving parts, making them less vulnerable to dust and temperature fluctuations.

Such thin client systems do have some disadvantages, however. If the server breaks down, then all the client computers will be out of use too unless a backup server is also available (an additional cost). Setting up and maintaining a thin client network requires considerable technical knowledge, which might mean hiring a technician. This extra expense will have to be weighed against the amount that will be saved by using the less powerful client computers.

Extra expenses

The costs of refurbished computers will depend not only on the supplier, but also on the recipient country, due to differences in import duties, shipping costs and the administration costs involved in the export and import process. One way to keep these costs to a minimum is to look for computers from local suppliers, especially if they can also provide technical support.

Other factors to consider when buying a computer, new or refurbished, include the time it will take to train staff, and to customize and configure the new setup. If the refurbished computers use a proprietary operating system, such as Microsoft Windows, then it is essential to make sure that any relevant licences and authentication certificates have been transferred from the original owner or are supplied by the refurbishing organization.

Finally, look for refurbished computers with good brand names as these tend to last longer. Top brands include Dell, Hewlett Packard and IBM (now Lenovo). ■

Toxic materials present in computers

- **Lead:** a typical monitor can contain more than 2 kg of lead.
- **Arsenic:** found in older monitors.
- **Mercury:** found in printed circuit boards.
- **Cadmium:** found in semiconductors.
- **Beryllium:** found in circuit boards
- **Chromium: found** in monitors.
- **Cobalt:** present in the hard disk.
- **Polybrominated diphenyl ethers** (PBDEs, also known as bromine dust): used as flame retardants.
- **Antimony trioxide:** also used as a flame retardant.

More information

Donated Computers for Nonprofits: Consider that donated computer carefully. TechSoup, January 2003.
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Guide to Accepting Donated Computers for Your School. Microsoft, April 2004.
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Q&A

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Affordable technology, but buy with care

In 2004 Open Research conducted an extensive study into the total operating cost of owning refurbished computers in Africa. Can these old computers really help to reduce costs?

➜ Our study suggested that top brand refurbished computers are worth it if they are not too old – about three or four years. In fact, our study suggested that a good-quality refurb may, in some instances, be a better buy than a low-quality new one. That was a surprise. Low-quality second-hand personal computers (PCs) should be avoided, simply because they are made of low-quality components. Whether or not refurbs can keep costs down depends on how much they cost. I heard recently that in Congo Brazzaville a second-hand Pentium III can cost as much as US$800.

What are the main costs involved with owning a refurbished computer compared to a new one?

➜ Our survey, interviews and workshops suggested that over a five-year period, the key differences between the ownership costs of new and refurbished PCs are: purchase price, hardware replacement costs, labour for repairs, support, and the cost of downtime (when the PC fails). The likely cost of failures in a refurbished PC (including spares, labour and down time) needs to be balanced against the lower purchase price. In the case of a low-quality refurbished computer, the cost of replacing hardware components alone can be 140% more than the original purchase price, and a high level of failure can be expected throughout the five years of ownership.

How long can users of refurbished computers expect them to last?

➜ Depending on their quality and age, probably no longer than three or four years, if it is three years old when you get it. Low quality refurbs might only last a year or two, or even less. Each component in a PC has a lifespan. For instance, on average you might expect the motherboard to begin failing from year four, and the monitor from year five. Some people say that a PC can last 10 years, but the data suggests that you are lucky if a new PC lasts more than 8 years, and that will be a good quality PC. At the 8 year mark the component failure rate is likely to be so high you will have to throw the machine away.

The European Union has introduced legislation making manufacturers of electrical goods more responsible for the ultimate disposal of their products (the WEEE Directive). Will this mean more PCs for use in developing countries, or will it encourage the dumping of electronic waste with a clear conscience?

➜ What is needed are tighter controls. Not just any old PC should be allowed to be exported to a developing country. And if WEEE helps with that, then it is great. But the real controls should come from the recipients. People in developing countries should be more selective, and more demanding, which practitioners recognize.

Some suggest that the advance recycling fee (ARF), or similar mechanisms, paid in Europe should also be shared with the developing country where the second-hand PC ends up. If a consumer pays the ARF in Switzerland, for example, and the PC is later shipped to Namibia, where it dies, that fee should not stay in Switzerland. But the procedure might be very difficult to administer. If there is thoughtful, considered demand for refurbished PCs, I don't really think it is dumping. It is dumping when, as in Nigeria, buyers in industrialized countries buy crate loads of old machines - no matter what - and ship them to Lagos for dismantling and resale on the local markets.

What happens when refurbished computers get to the end of their useful life? Are there enough possibilities in developing countries for recycling or safely disposing of old machines?

➜ Not really. In South Africa, e-waste is a growing business opportunity, and there are new entrants into the market all the time. The good thing about e-waste is that it can stimulate (very) small business development - just one or two people - and can support big business. There are a couple of major e-waste recyclers in South Africa. But for other countries in Africa, the picture is bleaker, especially those still trying to come to terms with basic waste management. ■

For more information on e-waste in Nigeria, see the Basel Action Network website: www.ban.org.

Note: The Open Research study was conducted in 2004 and some details may have changed (e.g. the prices of new and refurbished computers).

DAVID H. WELLS/AGE FOOTSTOCK/ANP